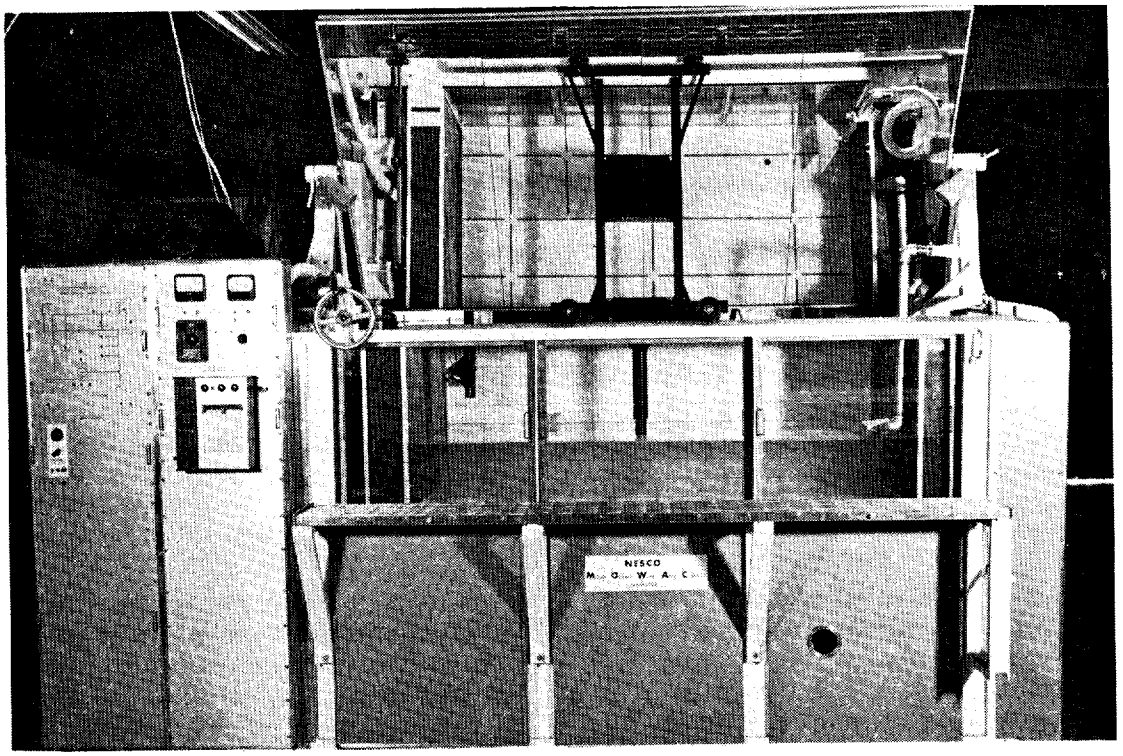

OCEAN WAVE AND CURRENT GENERATOR, DEVICE X6D14

TRAINING CATEGORY:

BASIC SCIENCE (2) (Physics-Nuclear)

ORIGINATING AGENCY:

DCNO (AIR); NAVTRASYSCEN

SECURITY CLASSIFICATION:

Device X6D14 is unclassified.

INTENDED USE:

To enable classroom demonstrations of wave and wind interaction, the gamut of sea states, tides, currents, water mass and material transport, coastal erosion, ocean bottom aggradation and degradation, and bottom topography representation via terrain model utilization for simulation.

FUNCTIONAL DESCRIPTION:

Device X6D14 is a compact electronically controlled device. It contains large glass side viewing areas with removable grids and an adjustable tilting mirror above the tank which provides means for observation and measuration. The principal operation of model ocean wave and current generator (MOWAC) can be described as follows:

The prime source of power in the device is the compressor fan driven by a 7-1/2 horsepower dc motor. The input and output air currents from the compressor are modulated by a series of four (4) rotating butterfly valves, each positioned 90° out of phase from the preceding valve. This arrangement is used to produce an alternate compression and rarefaction cycle of the air in the plenum, immersed in the demonstration tank.

The alternating sinusoidal pressure in the plenum modulates the water level, transmitting a wave action into the water and launching the wave into the demonstration tank.

The wave action can be used to demonstrate a variety of oceanographic phenomena, such as the interaction of waves with beaches, islands, and man-made phenomena. Provision has been made for increasing the depth of water in the tank, simulating a tidal effect to show the modification to the wave action. The interacting action of water currents, wave action, and wind phenomena can be demonstrated.

A 12" wide channel can be created in the tank by insertion of a dividing panel to demonstrate two-dimensional phenomena. A partical dispenser is provided which mounts on the trolley to disperse colored plastic particles where desired. This provides a means for conducting experiments in littoral drift and beach erosion.

A cross current generator produces eddy and whirlpool effects. Colored plastic particles, dispensible from a mobile hopper, as well as positionable buoyant nylon threads and beads demonstrate flow, transport, erosion and deposition. Current patterns, temperature strata and thermal mixing are measurable, demonstrable and traceable, utilizing infrared heating for insolation, and the injection of three (3) tank stored dyes, singly or combined, in cold, or heated water thermostatically controlled. A filter system enables capture of plastic particles for reuse, and a wave gage provides character translation and measurement on a chart recorder of the wave profile and tidal action.

PHYSICAL INFORMATION:

The basic structure consists of the wave tank and lower supporting section containing the compressors, pumps, hydraulic piping, and pneumatic duct work. Cabinets at one end of the system enclose the electronic assemblies while at the other end the enclosure protects the penumatic pipe-work, dye injector, and filter units.

The basic tank structure consists of welded I-beams enclosed by welded plate to form a watertight tank unit. Inserted and welded into the tank base are thirteen (13) stainless steel discs allowing the flux lines from the holddown electromagnetics to pass through the tank base to the models.

The dimensions of Device X6D14 are:

With Mirror: 18'8" L x 8' W x 9'6" H

W/O Mirror: 18'8" L x 8" W x 7'6" H

INSTALLATION AREA:

Classroom of size sufficient for viewing demonstrations.

POWER REQUIREMENTS:

110 V @ 1.0 amp., 220 V, single-phase, @ 10 amps., 220 V, three-phase, @ 10 KVA

SPECIAL REQUIREMENTS:

Water supply from 3/4" source. If supply is from public or private utility system, an antisiphon valve should be used to prevent contamination.

PUBLICATIONS FURNISHED:

NAVTRASYSCEN Technical Report No. 1860-1

PERSONNEL:

Instructor: One (1) trained in Oceanography

Trainees: 15 - 20

Maintenance: One (1) trained in electro-mechanical, electronic and hydro system.

CONTRACT IDENTIFICATION:

Manufactured by National Engineering Science Co., Pasadena, CA under NAVTRASYSCEN Contract No. N61339-1860.

LOCAL STOCK NUMBER:

6910-LL-C00-0272